barometer readings much in excess of the average during the whole voyage, and for the greater part of the month.

As early as January 4, a region of high barometer, with readings 30·3 inches, spread in over the Bay of Biscay from the Atlantic; this gradually extended eastwards over south-western Europe, and on January 12 the region intensified, readings of 30·7 inches occurring over the Bay of Biscay and western France. The anticyclone maintained its ground, and on January 17 and 18 was distinctly spreading northwards, the isobar of 30·5 inches embracing France, England, Denmark, and the greater part of Norway and Sweden. On January 20 the anticyclonic area was greatly augmented, apparently by an independent region of high barometer spreading down from the extreme north of Europe. The highest readings—30·9 inches—were situated over Lapland and Finland, and on January 21 the highest pressure was in the vicinity of the White Sea, the barometer at Archangel reading 31·39 inches. On January 22 the anticyclone was central over northern Russia, the barometer at Kuopio standing at 31·46 inches. The maximum height of the barometer was attained on January 23, when at Riga the reading was 31·58 inches, and the region of 31 inches and above embraced parts of England, Scotland, and Ireland, the barometer at some of the stations in the British Islands being higher than any previous record. The high barometer area continued to travel southwards, and on January 26 the centre was in the neighbourhood of Constantinople, but the highest reading had then decreased to about 31·1 inches.

The absolutely highest reading of the barometer on record is 31·72 inches, which occurred at Irkutsk on December 20, 1896, and at Semipalatinsk on December 16, 1877. The highest in the British Islands is 31·11 inches, at Aberdeen on January 31, 1902, and 31·10 inches at Fort William on January 9, 1896. The lowest reading on record at the surface of the earth, and reduced to sea-level, is 27·12 inches, at False Point, on the coast of Orissa, on September 22, 1885, and the lowest in the British Islands 27·33 inches, at Ochtertyre on January 26, 1884.

From about January 20 to January 26 the weather was intensely cold over western Europe, and an easterly wind was blowing for the most part. The Weekly Weather Report issued by the British Meteorological Office shows that, for the week ending January 26, the mean temperature was 9° F. below the average in the midland, southern, and south-western districts of England, and the deficiency amounted to 7° F. in several other districts. The minimum temperatures were as low as 5° F. and 10° F. in many parts.

STAR CATALOGUES.[1]

SOME astronomical work is so attractive that it readily finds support and imitation. The preparation of star catalogues scarcely belongs to that category. Such work is dreary and monotonous, and those who devote themselves to it are entitled to the acknowledgment that is invariably granted to those who are willing to sacrifice brilliancy to utility. There is little scope for the exercise of originality. Once the scheme is defined, the stars selected, and the needed accuracy attained, there is nothing to break the wearisome repetition of a purely mechanical process. The work can hardly be said to possess the attractiveness of permanence. The observations give the position of the stars at a certain epoch, and almost before the catalogue is available as a whole, the work of supplementing it has begun. The wayward and lawless proper motions of the stars tend to render the coordinates obsolete, and this cause alone will necessitate the repetition of the work upon which so much labour has been bestowed. Yet no work requires more care and forethought, and this will be painfully evident to those who read the introductions to the several works, the titles of which are quoted below. It will be equally evident to those who recall the names of those who have devoted themselves to this work, and who will thus be reminded that many astronomers, from Flamsteed to Airy, have been content to stake their reputation upon their contributions to the cataloguing of star places. It is the opportunity for the introduction of greater accuracy that affords the necessary compensation. Sir David Gill, than whom few can look back upon the accomplishment of a greater mass of work, probably views the completion of these catalogues with very considerable satisfaction, and regards them as rounding a well-filled career.

The usefulness of a catalogue will be more readily appreciated if the star places are required to make accessible other material to which it is at present impossible to give a final and convenient form. This is the case with the first of the catalogues on our list. The 8560 stars are not isolated points irregularly distributed over the sky, but are generally the brighter stars to be found in the zone allotted for observation to the Cape of Good Hope Observatory by the Astrographic International Congress. These stars form the fiducial points to which the unknown stars of the photographic plates will be referred. The coordinates, determined on one plan, will give great uniformity to the resulting photographic catalogue. All the observations have been made between 1896–9, and, since the plates have been taken approximately within the same years, possible errors arising from proper motion are effectually eliminated. Moreover, the advantages arising from employing stars taken at one epoch and observed on one uniform plan are patent. Apparently, in the use of facilities for reducing photographs, observers in the southern hemisphere were at a disadvantage compared with those in the northern, since the latter could immediately bring into use the admirably arranged catalogues of the Astronomische Gesellschaft; but the pains bestowed by Sir David Gill upon this piece of work have entirely reversed the conditions, and placed the Cape Observatory in the most favoured position, for, to a certain extent, he is able to select those stars for the reduction of his measures which are most suitably arranged upon the plate. The northern observers have to accept such stars as have been observed; but in forming a new catalogue, one would naturally observe those stars which will furnish the best data for subsequent reduction. An ideal scheme would be to select for each plate eight stars distributed uniformly round the circumference of a circle of about 55′ in diameter, the centre of which coincided with the centre of the plate, and, in addition, two stars near the centre of such plate; but owing to overlapping, whereby the four corners of one plate become the centres of four other plates, such a scheme does not work out practically, and on the average twelve or thirteen stars, somewhat irregularly situated, will be available for the reduction of each plate, and this number may rise to seventeen or eighteen stars.

The individual results on which the catalogue places rest have been published in the annual volumes. The details here presented enable one to follow the small corrections that have been introduced to eliminate systematic errors and to secure uniformity throughout. To the ledgers of right ascension three terms have been applied, one to reduce the right ascension to what it would have been if Newcomb's system had been adopted; a second correction, depending on magnitude, is required to reduce the R.A. of a particular star to what the observer would have recorded if the star had been of the fourth magnitude. The necessity of the third correction is not very clear. It has been required because of the small number of clock stars employed in each zone, "and perhaps also because of small outstanding errors in the adopted values of Level, Collimation, and Azimuth."

In order to obtain the greatest possible accuracy in the declinations, a system of small corrections has been applied

[1] "A Catalogue of 8560 Astrographic Standard Stars between Declinations −40° and −52° for the Equinox 1900 from Observations made at the Royal Observatory, Cape of Good Hope, during the Years 1896–99 under the Direction of Sir David Gill, K.C.B., F.R.S." Pp. lix+403 (London: Printed for H.M. Stationery Office by Eyre and Spottiswoode, 1906.)

"Catalogues of Stars for the Equinox 1900·0 from Observations made at the Royal Observatory, Cape of Good Hope, during the Years 1900–1904 under the Direction of Sir David Gill, K.C.B., F.R.S." Pp. xiii+123. (Edinburgh: Printed for H.M. Stationery Office by Neill and Co., Ltd., 1906.) Price 4s. 6d.

"Astrographic Catalogue 1900·0, Oxford Section, Dec. +24° to +32°. From Photographs taken and measured at the University Observatory, Oxford, under the Direction of Prof. H. H. Turner, F.R.S. Vol. i. Pp. lxvi+223. (Edinburgh: Printed for H.M. Stationery Office by Neill and Co., Ltd., 1906.)

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to the values in the annual volumes. These corrections are again three in number:—one required by the Chandler change in latitude; a correction depending, apparently, on some function of zenith distance, and which embraces flexure of the telescope and circle, and removes small uncertainties in the refraction tables. The necessity for the third correction is a little obscure. It is asserted to be necessary on account of small possible errors in the determination of the nadir, or to remove errors arising from abnormal refraction or irregular heating or flexure of the instrument. More details as to the manner in which the last correction has been derived would be welcome. It is contended that the application is justified, since the amount of the probable error of observation is reduced.

A feature of great interest is the comparison between the final places of the catalogue and those given in the earlier Cape catalogues or by other authorities. The main object is, of course, to derive the proper motion, but the real interest centres in the systematic deviations from other catalogues, mainly in the discrepancies shown by those of Cordova. It is impossible within narrow limits to do justice to this discussion, but the points raised are of the highest importance in observational astronomy, and exercise considerable influence on some questions of cosmical interest.

The second work on our list contains four catalogues. Two of these are quite small, and can be dismissed forthwith. One contains nearly a thousand stars culminating south of the zenith of the Cape Observatory. This list includes all stars brighter than 8·5 magnitude which are in the Cape Photographic Durchmusterung, but not in any catalogue of precision; also stars observed with comets or used in survey operations. The main portion, consisting of 3365 stars, culminating north of the Cape zenith, is of more interest and importance. The greater number of the stars is due to the prosecution of a scheme submitted by Sir David Gill to the Comité international des Étoiles fondamentales with the view of forming a zodiacal catalogue sufficiently wide to permit the determination of the moon's place at any observatory and in any part of its orbit by heliometer measures of the distance and position angle of a lunar crater from suitably surrounding stars, or of determining in a similar way the position of any of the larger planets. Of course, it is not possible to determine with the highest accuracy all stars which may be employed for such purposes, but it is hoped that by concentrating the attention of meridian observers on a select number of stars, suitably situated, and by adopting processes likely to eliminate systematic errors, a very considerable improvement in accuracy may result. Several observatories have shown their approval of the scheme by taking part in the observations, and it is hoped that an adequate determination of star places for 1900 will be the outcome, while observations repeated at intervals of twenty-five years would provide all the data required for the most rigorous determination of the places of moon and planets.

The third work is different in its design and more comprehensive in its plan. The star positions for which the means of reduction are supplied number no less than 65,750, and when it is remembered that these stars are situated in a narrow zone, two degrees in width, on the small circle of 31° dec., we are able to learn something of the magnificence of the scheme which proposes to treat the whole sky on a uniform plan. What strikes one with the most force is the fact that a small observatory, the funds of which are necessarily strictly limited by the many demands that are made on the university chest, has been able to carry to a successful issue a scheme of such magnitude: has competed with the resources of great national observatories, and has found itself second to none. Prof. Turner has exhibited qualities of administration of the highest order. He has known how to impart to a comparatively untrained staff the enthusiasm which he himself experienced, and to secure in every part of the work that uniformity of excellence and rigorous accuracy which are essential for the maintenance of its international repute. To him and to the little band which has nobly seconded his efforts we can only offer our heartiest congratulations.

Since Prof. Turner has recalled in the most prominent manner to what extent the scheme has benefited by those who were responsible for the conduct of the observatory in the past, it is not out of place to record here that it was the well-placed generosity of Warren de la Rue that enabled the University of Oxford to play a worthy part in the plan which has been brought to so happy a completion. It is encouraging to remember that the energy of the late Prof. Pritchard was not exhausted, and that, at the age of seventy-nine, he could contemplate embarking upon a new and arduous enterprise. This is the first volume of eight that will appear, and there can be no hesitation in saying that the completion of such a work amply justifies the existence of the University Observatory. Twenty years have passed since de la Rue made his gift, and practically for twenty years the staff of the observatory has been devoted to the completion of this task. Some slight conception of its extent can be inferred from the fact that the titles of the papers immediately connected with this subject fill more than three quarto pages.

At the end of a long article it is impossible to do justice to the many technical points that are necessarily raised in the introduction. It must suffice to illustrate the general policy that Prof. Turner has pursued. This will enable us better to appreciate the exercise of those qualities of administration which have proved so effective. The star images have been measured to the thousandth part of the distance between the *réseau* lines, subtending an angle of 300 seconds in the focal plane of the telescope, or the limit of accuracy has been set at 0″·3. This may or may not be the greatest accuracy to which it is desirable to aim, but to have attempted another place of decimals would, says Prof. Turner, have delayed the completion of the work, with the limited staff at Oxford, for several years, and perhaps imperilled its completion altogether. This recognition of his limitations has been amply justified. Again, it no doubt required considerable self-restraint to confine the measures to one series of images, since greater accuracy would probably have been obtained if the measures had been distributed over more images rather than confined to repeated bisections of the same; but such a process would involve the additional labour of taking means between quantities which were not similar, and so give additional risk of numerical errors. Prof. Turner is no doubt warranted in asserting that a just relation has been maintained between the labour expended and the accuracy attained.

W. E. P.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—In accordance with the regulations for the administration of the Gordon Wigan fund, the special board for physics and chemistry reports that the first award of the prize of 50*l.* from the Gordon Wigan income for physics and chemistry for a research in chemistry has been made to F. E. E. Lamplough, scholar (now fellow) of Trinity College, for his research on the determination of the rate of chemical change by measurement of gases evolved.

Dr. Hobson, of Christ's College, has been appointed chairman for the mathematical tripos, part ii., for the year 1907.

A course of lectures on special zoological subjects is being given at the zoological laboratory during the Lent term. The course includes lectures by the following:—Mr. Forster Cooper, on living and extinct elephants; Mr. Stanley Gardiner, (1) marine rock formations, (2) the distribution of marine animals; Mr. Imms, some recent discoveries in the morphology of insects; Mr. Perrin, trypanosomes and spirochætes; Mr. Potts, parasitism in the Crustacea; Mr. Punnett, (1) metamerism, (2) sex; Mr. Gadow is lecturing on "Environment and Geographical Distribution of Animals" during the Lent and Easter terms.

PROF. GEORG KLEBS, director of the botanical institute of Halle University, has been elected to succeed Prof. Pfitzer at the University of Heidelberg.

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